Investigation of the Transition from Lath to Plate Martensite in Fe-C

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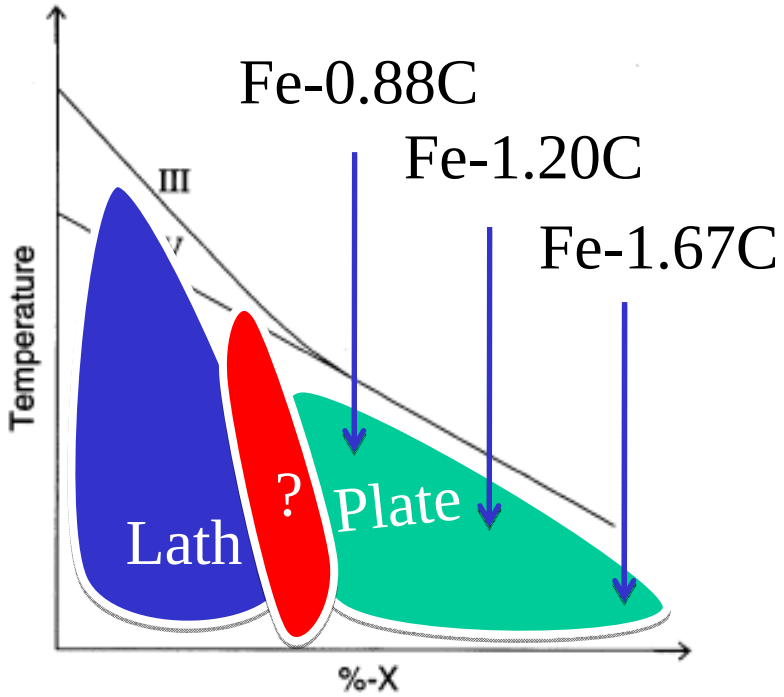
Background

Steel grades

- Fe-0.88C
- Fe-1.20C
- Fe-1.67C

Carbon gradient

0-1.67C



Characterization - LOM

Lath martensite (~0.3C)
350°C (4sek)

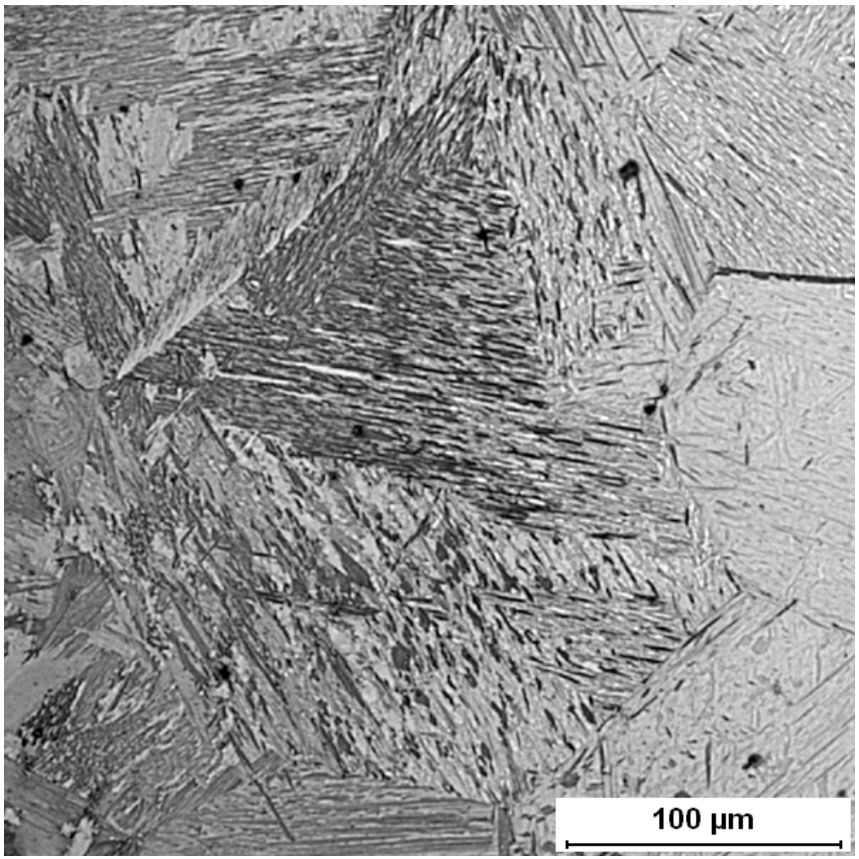
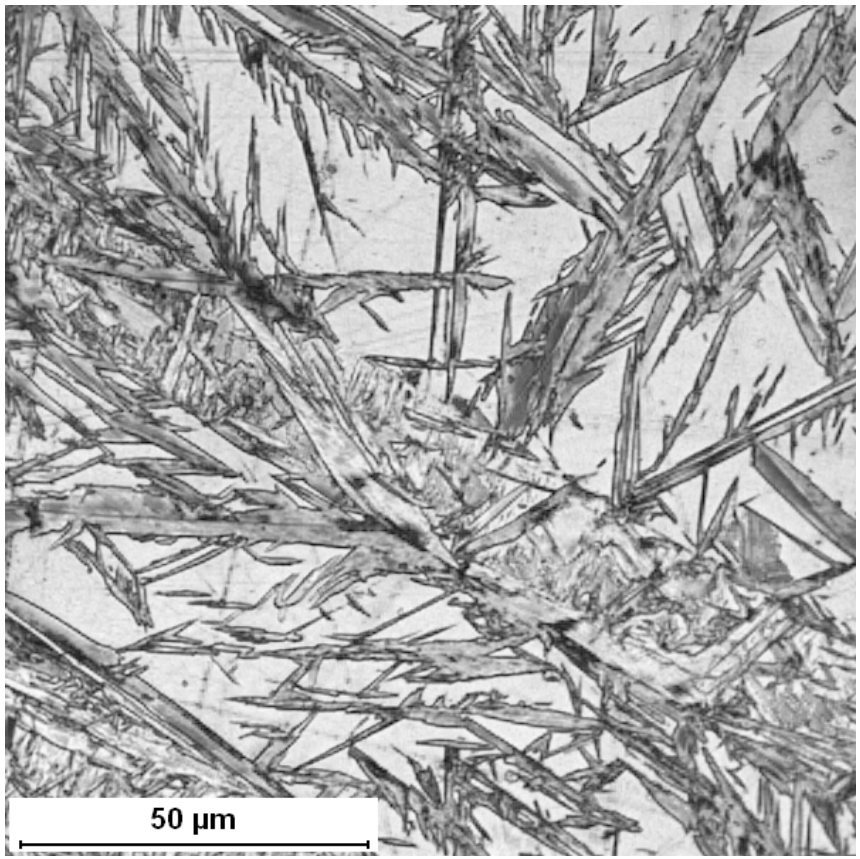


Plate martensite (~1.6C)
25°C



Characterization - SEM

Lath martensite (~0.3C)

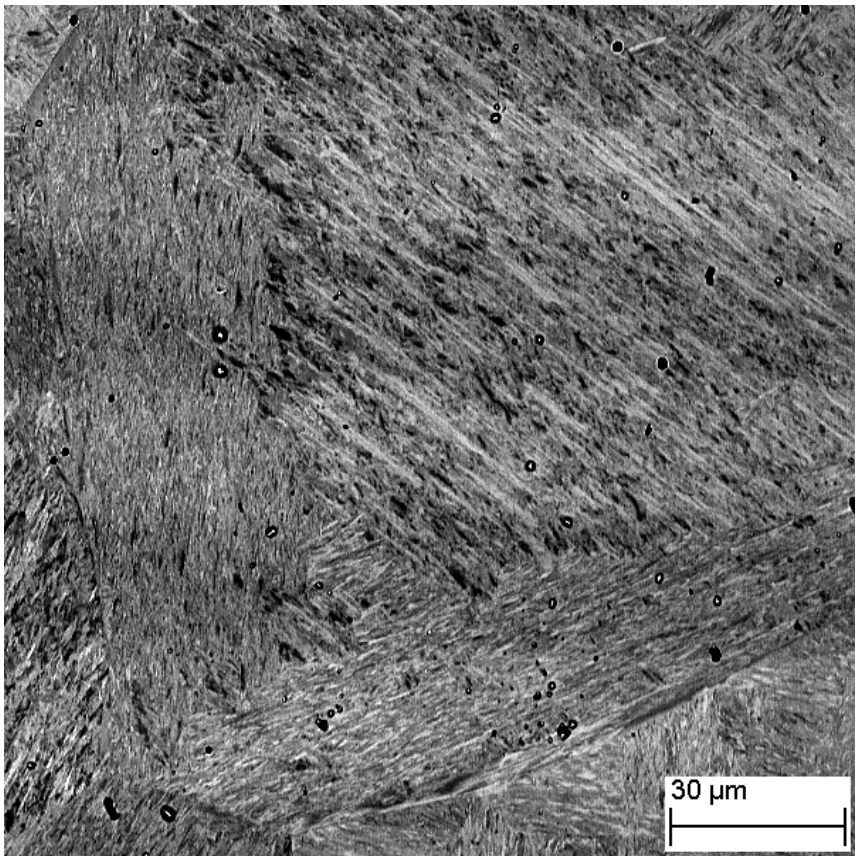
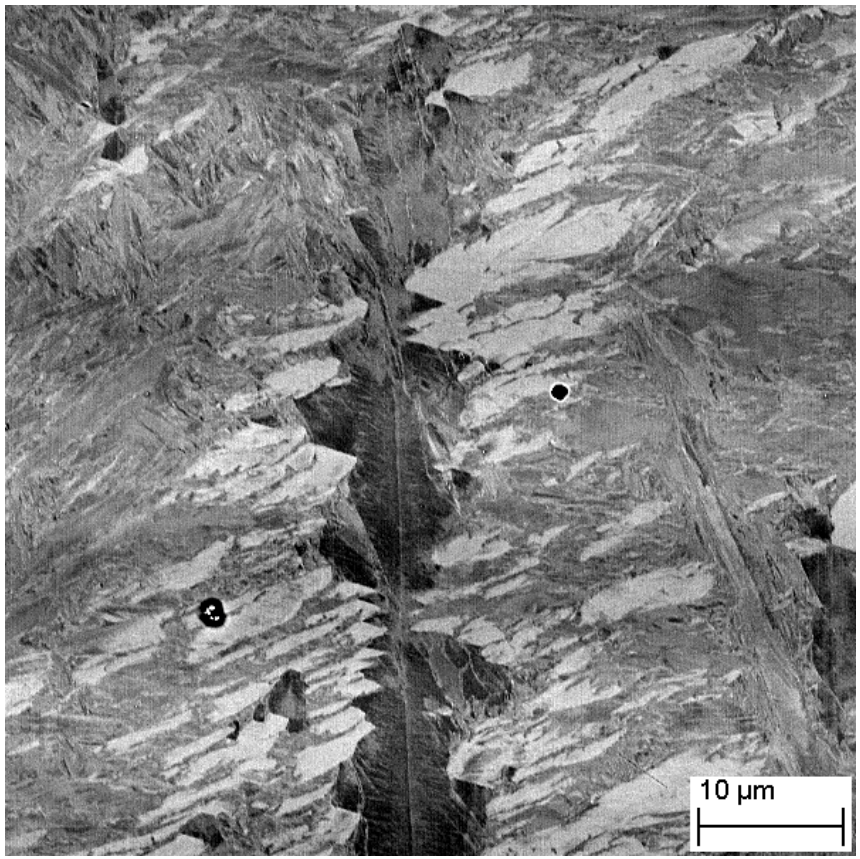
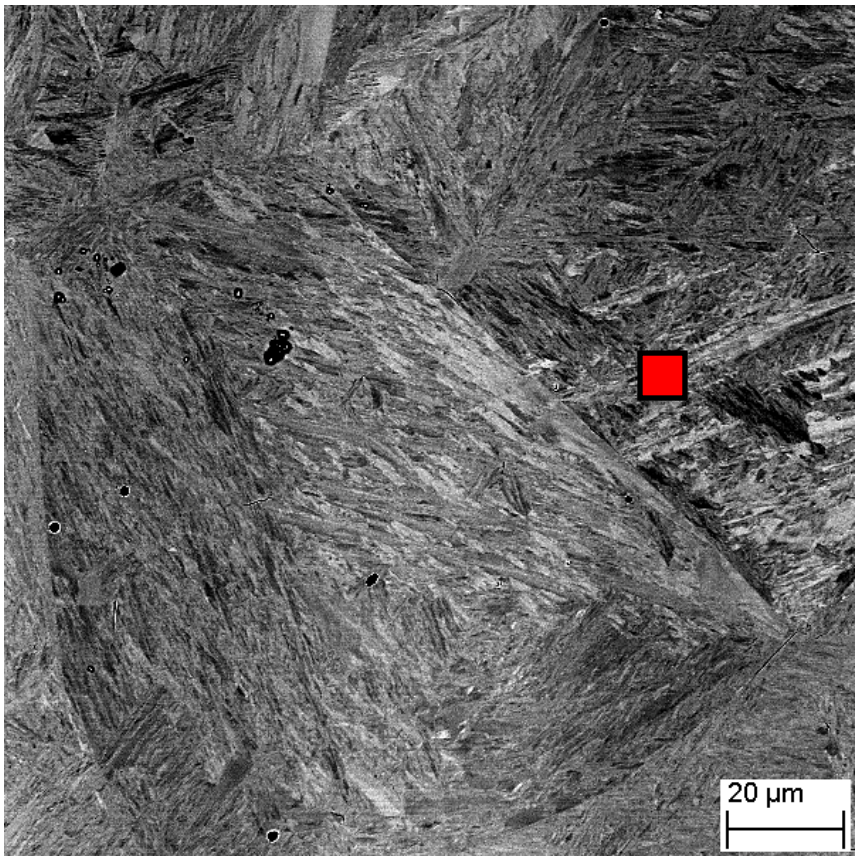


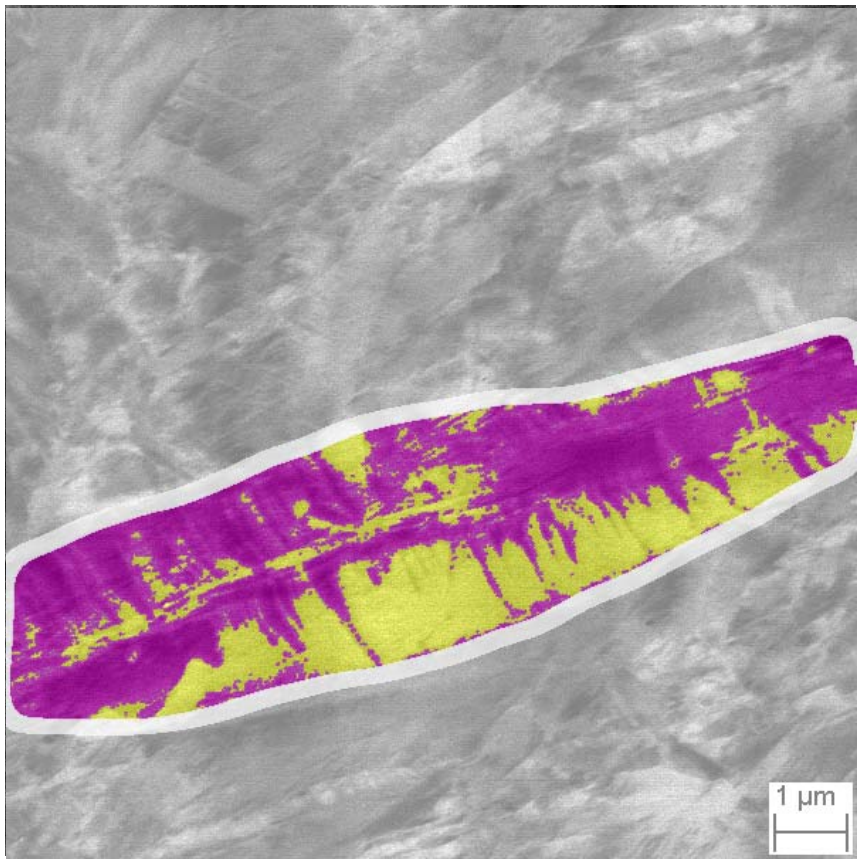
Plate martensite (~1.2C)



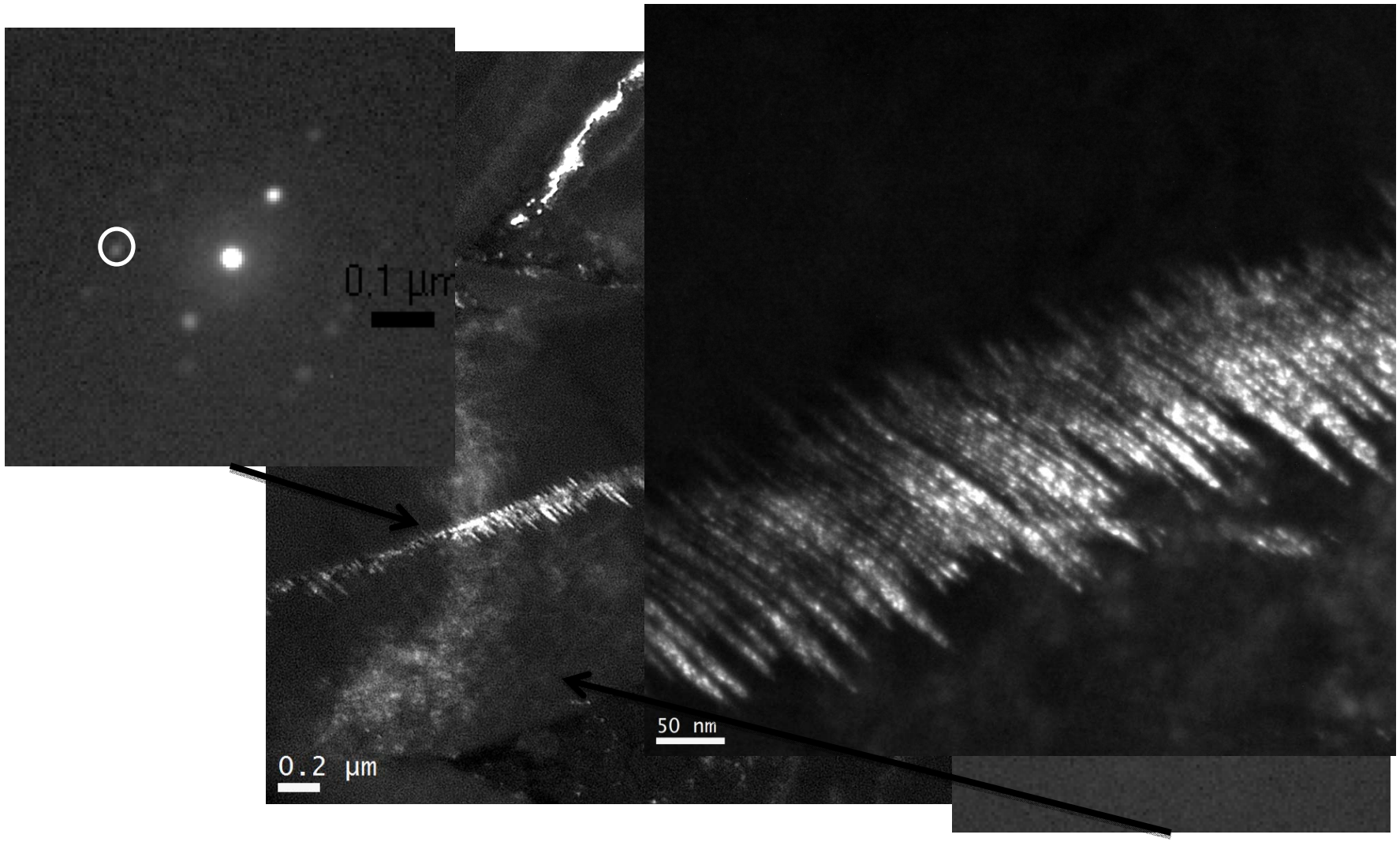
Characterization - SEM

Martensite (~0.7C)

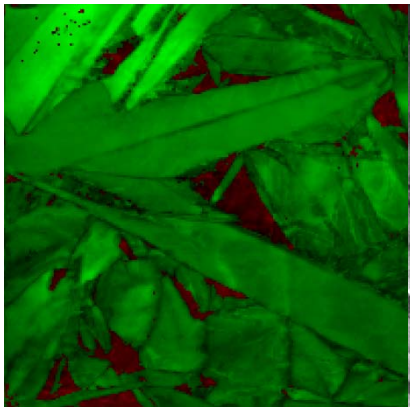


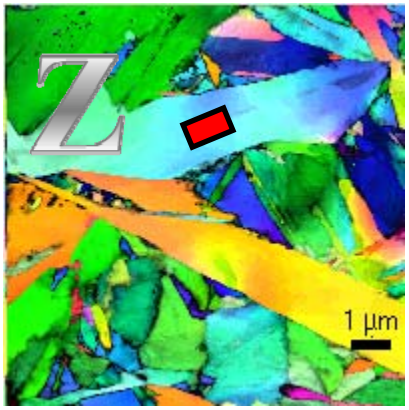


Characterization - TEM



Characterization - TEM





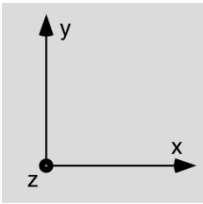
TEM-ACOM

Automated Crystallographic Orientation Mapping.

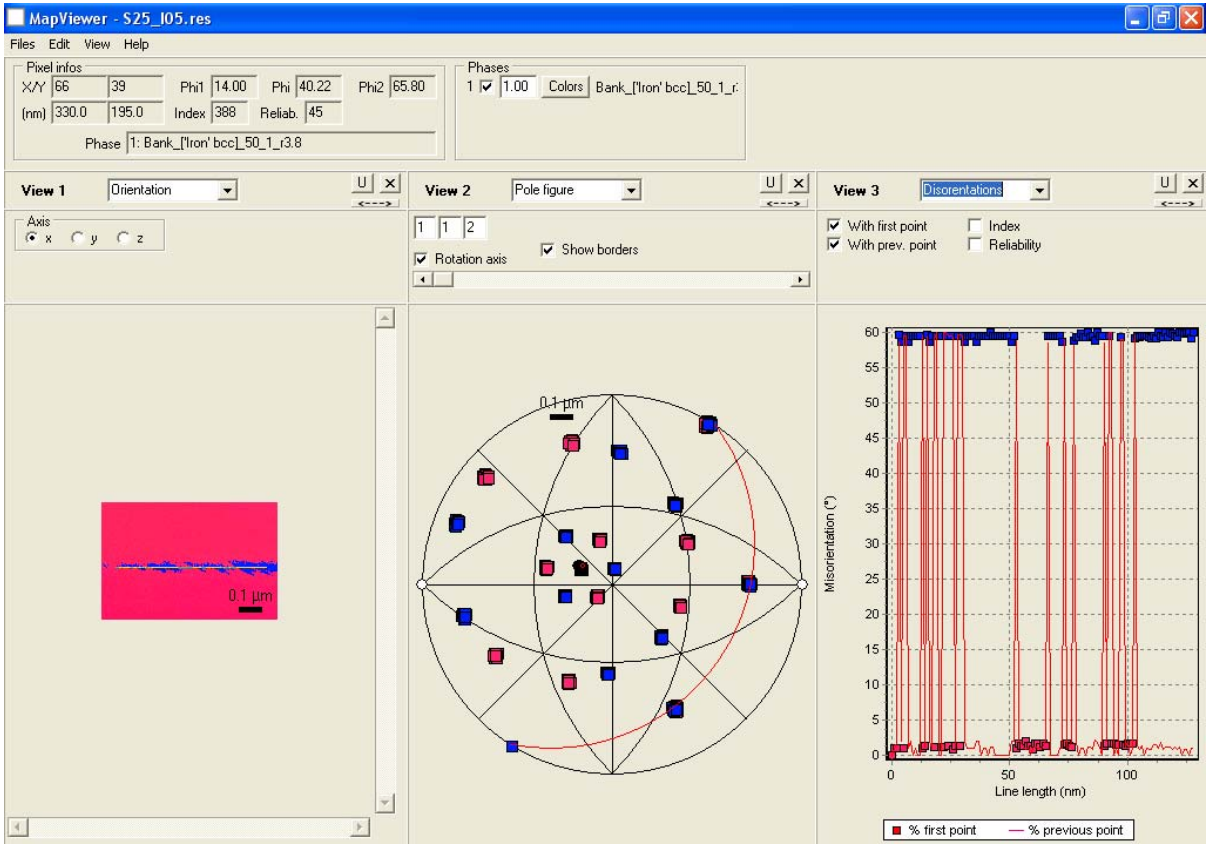
What can we obtain:

Phase maps

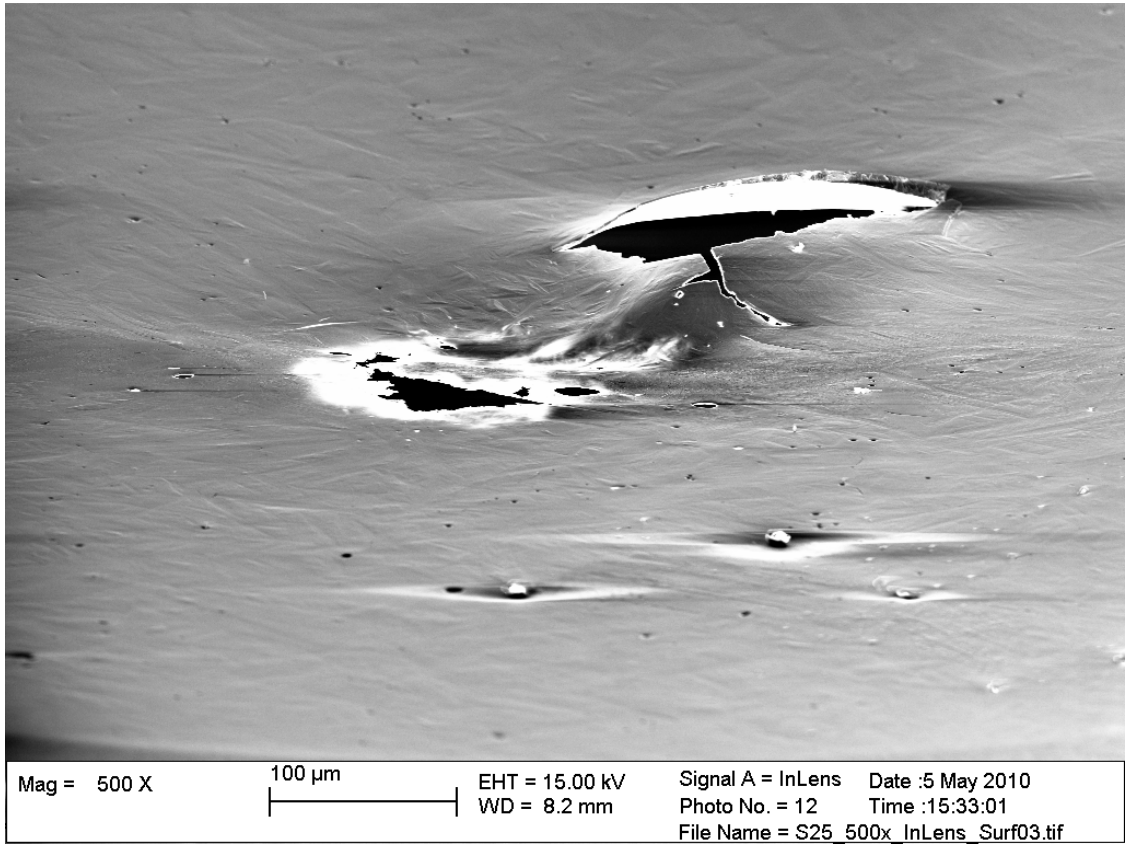
Orientation maps



Characterization - TEM

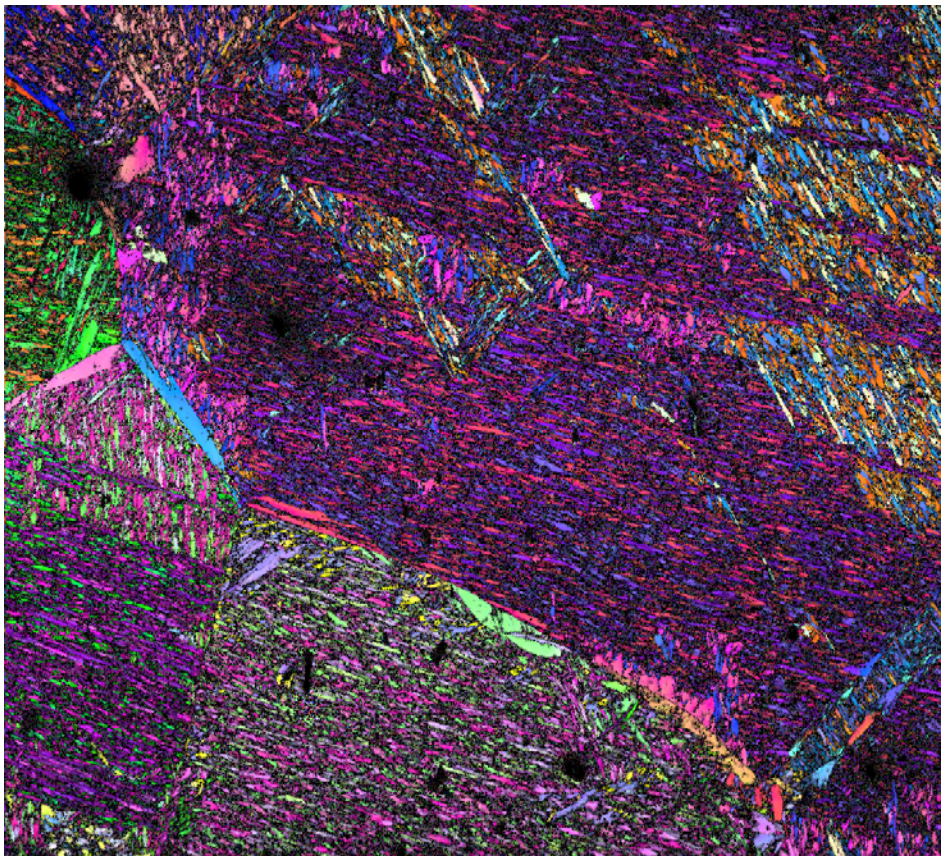


Characterization

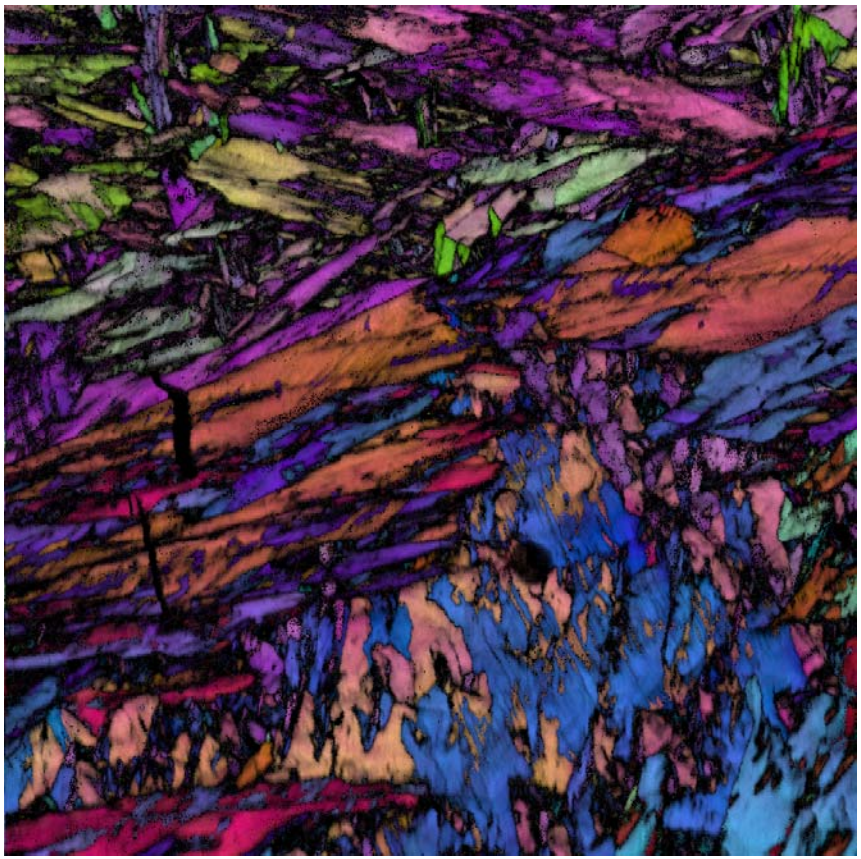


Characterization - EBSD

Fe-0.88C (220x200 µm)
Step size 300 nm

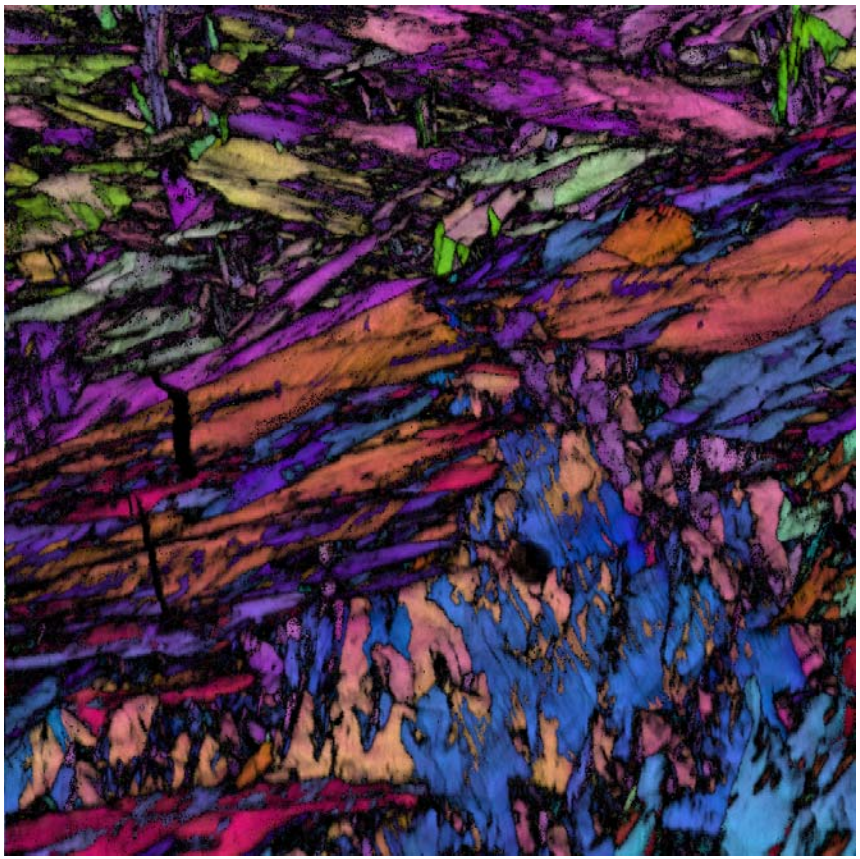


Fe-1.2C (40x40 µm)
Step size 50nm



Characterization

IPF (Martensite) + CI



FEG-SEM with EBSD

Backscattered electrons from a surface area of roughly

50 nm will contribute to the EBSP picked up by the camera.

Conclusion:

Detection of individual twins in plate martensite will be difficult with this technique.

Summary

Gradient shows:

- Lath martensite 0-0.6C
- Mixture between 0.6-1.2C
- Plate martensite >1.2C

Intersection between the plateaus and the morphological transition from lath to plate martensite agrees well